be shown that the two species have been derived from a common ancestor; in other cases one species is evidently derived from another occurring stratigraphically below it."

Contrary to the prevailing opinion that fossil oysters, on account of their great variation, are of little value in the recognition of strata, our authors are led by their observations to conclude "that certain forms of the Ostreidæ possess very distinct specific characters, have definite geologic horizons, and are of the greatest value in stratigraphic work." They recognize the fact, also, that no scheme of classification can be entirely satisfactory until both fossil and recent oysters have been "the subject of thorough investigation from a phylogenetic and morphologic standpoint, according to the lines of research followed out by Hyatt in the cephalopods, Jackson in the pelecypods, Beecher and Schuchert in the brachiopods and Von Koch in the stony corals."

Sixty-one accepted species and varieties of fossil oysters are listed as occurring in the Texas Cretaceous, and twenty-three indefinite and abandoned species. Of the former forty-seven are tabulated as characteristic of definite horizons (p. 31).

Under the caption 'Historical Statement of the Discovery in the Texan Region of the Forms referred to *Gryphæa pitcheri*, Morton,' the confusion of various authors concerning this famous fossil is clearly presented and the sources of error pointed out. The following topics of more than ordinary interest are also discussed: 'Differentiation,' 'Geographic and Stratigraphic Distribution of the Lower Cretaceous Gryphæas,' 'Specific Classification and Evolution of the Lower Cretaceous Gryphæas,' and the bulletin closes with careful descriptions of six species, characteristic of the Lower Cretaceous, which the authors believe to merit recognition, supplemented by a brief statement of their relationship. The excellent and copious illustrations which accompany this paper deserve especial commendation. Of thirty-five plates, thirty, including copies of figures from Hall, Marcou and Roemer, are devoted to Gryphæas; of the remainder, one is a view of a living oyster bed, showing the profusion of molluscan growth, the others sections showing the stratigraphic occurrence of the Texas Cretaceous Ostreidæ.

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BOOKS RECEIVED.

Calcul de généralisation. G. OLTRAMARE. Paris, Hermann. 1899. Pp. viii+191.

Report of the Commissioner of Education for the year 1896-97. Washington, Government Printing Office. 1898. Vol. II. Pp. 1137-2390.

The Human Body. H. NEWELL MARTIN. Fifth Edition, revised by GEORGE WELLS FITZ. New York, Henry Holt & Co. 1898. Pp. xiv+408.

Elements of Graphic Statics. PROFESSOR L. M. HOSKINS. New York and London, The Macmillan Company. 1899. Pp. viii+199, and eight plates. $2.25.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *American Naturalist* for January opens with an article by Dr. Arthur Hollick discussing the relation between forestry and geology in New Jersey. Professor W. M. Wheeler gives a biographical sketch of the late George Baur, which is accompanied by a biographical sketch containing 144 titles. Articles follow by Miss Julia B. Platt, describing certain phenomena of geotaxis; by Professor Cockerell, on 'Vernal Phenomena in the Arid Regions,' and by Professor E. W. MacBride, reviewing Seitaro Goto's work on the development of *Asterias pallida.*

THE *American Geologist* for January opens its twenty-third volume with a notice of Edward Drinker Cope, by Miss Helen Dean King, with a portrait and a bibliography containing 815 titles. There follow articles by Dr. N. H. Winchell, on 'Thalite and Bolingite from the North Shore of Lake Superior,' and by Mr. Marsden Monson, on 'The Loss of Climatic Evolution.'

THE *Journal* of the Boston Society of the Medical Sciences for December, 1898, contains an abstract of an interesting paper by Dr. Morton Prince entitled 'An Experimental Study of Visions,' also an important paper by Dr. Franklin W. White upon 'the Germicidal Properties of Blood Serum.' Among the conclusions reached are these: Human blood serum differs greatly in its germicidal action

upon various bacteria; in fatal diseases it sometimes loses part of its germicidal power for the colon bacillus shortly before death, but more frequently retains this power for several hours after death; human blood serum does not lose its germicidal power for typhoid and colon bacilli, even in the late stages of chronic wasting disease.

THE *Philadelphia Medical Journal*, which during its first year has secured a high position among medical journals, will hereafter publish a monthly supplement of 60 pages containing original articles.

SOCIETIES AND ACADEMIES.

NATIONAL GEOGRAPHIC SOCIETY, JANUARY 6, 1899.

Abstract.

'THE Work of Glaciers in High Mountains:' By Willard D. Johnson. The greater number of the imposing forms in the summit regions of nearly all high mountains are of unknown origin. They are, however, strictly confined to tracts which either have in the recent past been glaciated or are glaciated now. Presumably, therefore, they are of glacial origin. But the difficulty is that, according to the known laws of glacial erosion, they are unintelligible.

The recognized process in glacial erosion is scour. This process, like aqueous corrasion, must always tend—in uniformly resistant and unfractured material—to produce graded slopes. But in glaciated summit regions, especially in granite and in tracts of that rock which answer most nearly to ideal conditions of uniform hardness, the topography is essentially that of flat valley floors and of upright cliffs, transverse as well as longitudinal to the direction of flow. In sound rock both glacial scour and aqueous corrasion will be not only incompetent but inimical to the production of such forms.

An unrecognized process appears to be that of sapping. The transverse, and therefore buried, cliffs in the glacier's pathway, as well as the amphitheatral cliff at its head, are cliffs of recession. The action of scour is downward and outward with the glacial advance, but the action of sapping is horizontal and backward. It is seldom lateral, and then only for a brief space. The flat valley bottom, as well as the parallel valley walls (where subsequent scour has not dulled their upright profiles), are by-products of recession of the transverse cliff.

So long as, along any advancing line, it continues active, sapping will be altogether dominant over scour, accomplishing large results in excavation; but its action, apparently, is by successive attacks, from point to point, and has relatively brief duration. Its forms, thereafter, arrested in development, become obsolescent under the contiuous action of scour, and the rounding-off of angles puts them seemingly into the category of scour forms.

The following hypothesis is advanced as to the cause of glacial sapping: The glacier protects its bed against the sharp variations of temperature which, by mechanical disintegration, waste exposed slopes. At the same time the covered rock surface is maintained close to zero, Centigrade—a critical temperature. By tearing away at its head from the mountain slope, and by reason of initial irregularities of bed along its line of flow, the glacier is broken across. If the depth of ice be not too great these breaks, or crevasses, will penetrate to the bottom. Along the narrow transverse line of bed, or floor, thus exposed—during summer, while the crevasse is open—there will be oscillations of temperature, between day and night perhaps, accomplishing an alternation of freezing and thawing. This alternation across the freezing point, at the crevasse foot, will be much more frequent than upon the exposed slopes without—a diurnal, rather than a seasonal, change. The crevasse foot will thus be a line of sharply localized and abnormally vigorous weathering, by coarse mechanical disintegration. The glacier is an agent here, directly, only in the removal of waste products. Frost-fracturing acts vertically downward, as well as horizontally backward, into the cliff, which it thus undercuts; but the products of its downward work are much less readily removed, and failure to remove operates to defeat downward action. Thus the cliff recedes, leaving in its trail an approximately flat and horizontal floor. In the slight unevennesses of this floor, after glacial conditions have passed and the cañon has become emptied, rock-basin lakes accumulate.